
PROGRAMME PAPER

The development of an adolescent smoking cessation intervention—an Intervention Mapping approach to planning

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Abstract

The objective of this project was to develop a theory- and evidence-based adolescent smoking cessation intervention using both new and existing materials. We used the Intervention Mapping framework for planning health promotion programmes. Based on a needs assessment, we identified important and changeable determinants of cessation behaviour, specified change objectives for the intervention programme, selected theoretical change methods for accomplishing intervention objectives and finally operationalized change methods into practical intervention strategies. We found that guided practice, modelling, self-monitoring, coping planning, consciousness raising, dramatic relief and decisional balance were suitable methods for adolescent smoking cessation. We selected behavioural journalism, guided practice and Motivational Interviewing as strategies in our intervention. Intervention Mapping helped us to develop a systematic adolescent smoking cessation intervention with a clear link between behavioural goals, theoretical methods, practical strategies and materials and with a strong focus on implementation and recruitment. This paper does not present evaluation data.

Introduction

In the past years, a growing number of adolescent smoking cessation interventions have emerged. To date, the evidence for effectiveness is rather mixed. Whereas some reviews conclude that smoking cessation intervention is effective [2], others conclude that we need additional evidence to draw conclusions about effectiveness [3, 4]. It is generally assumed though that interventions based on a cognitive-behavioural approach are most likely to be successful [2–4].

A major challenge in smoking cessation is to get smokers to participate in the interventions. Among adults, the median recruitment rate for participation in smoking cessation interventions is 2.0% [5]. Various studies indicate that recruitment is also a challenge in adolescent smoking cessation. For instance, Leatherdale *et al.* [6, 7] found that 77% of Canadian adolescents planning to quit preferred to quit on their own and that Canadian youth has a rather negative perception about formalized smoking cessation interventions. Backinger *et al.* [8] estimated that recruitment rates in adolescent smoking cessation are between 2 and 10%. If we cannot overcome these problems, it is unlikely that smoking cessation programmes will have a significant effect on adolescent smoking.

Intervention Mapping (IM) is a planning tool for the development of theory- and evidence-based

health promotion interventions that incorporates the anticipation of programme adoption and implementation from the start of the development process [9]. IM comprises six phases, each with clear tasks and a clear end product (see Fig. 1).

One of the key features of IM is that the mapping process leads to transparent descriptions of the decisions made during the intervention development process, demystifying the logic between programme objectives, intervention strategies and their theoretical underpinnings.

This article describes how we used the IM methodology to develop an adolescent smoking cessation intervention consisting of both new and existing materials. In addition, we will describe how IM was used to set up an implementation and evaluation plan as part of the development process. The article does not include the results of programme evaluation.

Methods and results

IM Phase 1: needs assessment

Methods

At the start of the programme development process, we established a planning group comprising interventionists and researchers from the Danish Cancer Society (DCS) and coordinators being responsible for smoking prevention at the local level. DCS lead the daily planning of the project; local coordinators were regularly involved in programme planning. We started with a needs assessment to gather information about adolescent smoking cessation behaviour, the target group and the educational system. We conducted a pilot study of smoking cessation counselling in various Danish youth education settings. This study primarily addressed recruitment barriers and the implementation capacity of schools. We conducted a literature study focusing on identifying individual and environmental factors related to smoking cessation. We searched for scientific papers in PubMed and PsycInfo using the keywords 'smoking cessation', 'adolescence', 'youth' and 'quitting', and we selected longitudinal studies from Western Europe, North America and

Australia with a focus on determinants of smoking cessation. In addition, we identified examples of effective intervention studies. We included studies with at least 300 participants, a control group, a follow-up period of at least 3 months and effects on smoking cessation. In order to identify effective intervention elements, the studies were analysed with regard to intervention content. Finally, we conducted a qualitative study among adolescents who had tried to quit smoking, focussing on the strategies they had used in attempts to quit smoking and on their attitudes and beliefs towards the process of smoking cessation and smoking cessation interventions. The outcomes of this needs assessment served as an evidence base for the goals of our intervention programme.

Results

Pilot study. In collaboration with local coordinators, we conducted a study on the feasibility of a comprehensive programme including five group counselling sessions for students aged 16–20 years in two technical schools and in one social and health school. After programme implementation, we interviewed students, counsellors, school leaders and coordinators with regard to satisfaction with the programme, barriers for recruitment among the students and barriers for implementation at the schools [10].

When the programme was implemented during school hours, we managed to recruit about 5% of all daily smokers. When the programme was implemented after school hours, we were not able to recruit sufficient participants to run the counselling sessions, even in schools with more than 500 smokers. In addition, the study revealed that schools were rather reluctant to implement the programme during school hours mainly because of an overloaded teaching programme. Other implementation barriers were the incompatibility of the programme and the class structure with the majority of students being non-smokers and the lack of interest in participation among smoking students. Schools, however, expressed positive attitudes towards using the school as a setting for smoking cessation programmes, as long as such programmes would not coincide with teaching hours.



Fig. 1. Protocol for the Intervention Mapping procedure. Source Bartholomew *et al.* [9].

In addition to the comprehensive counselling programme, we tested an event-based minimal intervention. The intervention consisted of a cessation stand with two counsellors providing carbon monoxide (CO) measurements. This intervention ran

during school breaks and lunch hours. This event-based intervention concept seemed to be far more popular among students than the comprehensive programme; in some cases, over 50% of smoking students participated in the events. We also found

that a number of students received the short counselling more than once. We did not test the effect of the short counselling, but among adults, minimal counselling provided by general practitioners has been found to have a small effect on smoking cessation [11].

Based on the outcomes of our pilot study, we concluded (i) that a conventional comprehensive smoking cessation strategy would interfere with widespread implementation, both on the individual and the school level and (ii) that a minimal event-based intervention approach would be more easy to implement in a large number of schools and would have more potential for recruiting a substantial part of the smokers.

Literature review. Our review of the literature on determinants of adolescent smoking cessation revealed that quitters, compared with the continuing smokers, have clearer intentions to quit smoking [12, 13], have higher self-efficacy expectations regarding quitting [12], are more likely to perceive the negative health consequences of smoking as personal relevant [14], have more academic success [15, 16], have less psychological and social problems [17], are less likely to smoke to cope with psychological problems [18, 19], smoke less [16, 18, 19], have smoked for a shorter period of time [15], are less addicted to nicotine [18, 20], associate with fewer smokers [13, 15, 16, 21] and experience more social support for cessation [17].

We also searched the literature for studies on school smoking policies, the accessibility of cigarettes and the pricing of cigarettes. Although these factors have been shown to be related to smoking in general [22], we could not find any empirical evidence that these factors were relevant for adolescent smoking cessation. Further, there was already at the time of the intervention, a general ban on indoor smoking on all youth schools in Denmark.

This literature suggests that both intra- and interpersonal factors are associated with adolescent smoking cessation and that factors like coping skills, self-efficacy, individual health relevance and social support are all relevant for cessation interventions.

Content analysis of effective adolescent smoking cessation interventions. We identified two papers

which met our selection criteria: 'Not On Tobacco' [23] and 'Project X' [24]. Both interventions were based on a cognitive-behavioural approach. The 'Not On Tobacco' programme focused on the following: motivation, stress management, preparation for stopping, understanding and management of social pressure (both social and from media) and skills building. In Project X, the focus was on the following: motivation and decisional balance, knowledge of the harmful contents of cigarettes, management of stress, anger and immediate problems after quitting, insight in the decision-making process regarding quitting and the actual quitting process and maintenance strategies (including weight control and focus on other behaviours).

Based on this content analysis, we concluded that both motivation enhancement techniques and the development of coping skills for both individual and social situations should be crucial components of adolescent smoking cessations' programmes.

Qualitative study. Adolescent smoking cessation was further investigated in a qualitative study [25]. This study suggested that adolescent smoking cessation is an individual process and that a broad variety of coping strategies are used in all smoking cessation stages. We could not identify a single coping strategy being superior in explaining successful cessation, but we found that success was related to whether or not the quitters were committed to a learning process in which different strategies were tested, evaluated, retested, etc.. This suggests that future interventions should be flexible regarding both structure and content and that interventions should stimulate a positive learning circle in which coping, commitment and self-efficacy are developed in a self-enhancing process. Further, programmes should be appealing to youth, not patronizing and easy to attend, and they should include a motivational or incentive element.

Programme outcomes

All in all, we concluded that there is a potential for implementing an effective school-based adolescent smoking cessation intervention in Denmark. Such an intervention should have the potential to be implemented in at least 90% of the schools, to reach

over 30% of daily smokers and to increase the annual quit rate from 5% (the estimated quit rate among smokers who do not receive support) to 10%.

When implemented in all Danish schools, this would reduce the adolescent smoking rate with about 1.5%, about 3600 adolescents in the age group of 16–20 year olds.

IM step 2: programme objectives

Methods

The second phase in IM concerns specifying programme objectives. The first task is breaking down general health-promoting goals and defining objectives targeting specific sub-behaviours: 'performance objectives' (PO). POs refer to sub-behaviours or preparatory behaviours that enable the health-promoting behaviour. In short, the performance objectives were formulated by answering the question: 'What do participants of this programme need to do to perform the health-related behaviour?' Since our needs assessment suggested that successful smoking cessation was related to high motivation and commitment, high self-efficacy and strong coping competencies, we defined objectives for strengthening quitters regarding these conditions. The Trans-theoretical Model (TTM) [26] and Self-Regulation Theory (SRT) [27], both suggesting specific actions needed to reach health goals, guided the specification of a primary set of objectives. This primary list was validated among both experts and practitioners with experience in adolescents' smoking cessation. Our final list of objectives are summarized in the first column of Fig. 1.

Once performance objectives were specified, we returned to the needs assessment outcomes to identify psychosocial behavioural correlates that were deemed both relevant for the purpose of our programme and changeable. Assessments of importance we based upon our review of studies on the correlates of smoking cessation, assessments of changeability on general insights about behavioural change and the results of adolescent smoking cessation programme evaluations [2, 9, 28, 29] (see Table I).

Subsequently, we further specified programme objectives by creating a matrix of change objectives. This matrix was created by crossing the performance

Table I. Cognitive and social determinants identified in the needs assessment

Cognitive determinants	Importance	Changeability
Knowledge ^a	+	++
Self-efficacy ^a	++	+
Attitudes ^a	++	++
Academic skills	++	0
Coping skills	++	+
Smoking history	+	0
Social determinants		
Number of smokers in social environment	++	0
Social support for smoking cessation ^a	++	+

The judged importance (I) and changeability (C) were used to select determinants for the matrix.

^aDeterminants included in the matrix.

objectives with the psychosocial correlates (Fig. 2). For each cell, one or more change objectives were defined, specifying what programme participants need to learn to accomplish the performance objective. For instance, under the performance objective 'make coping plan' and the determinant 'knowledge', the change objective is formulated by answering the question: 'What needs to be changed in relation to knowledge in order for the participants to be able to make a coping plan?'

In the wider planning process, the matrix function as planning backbone both with regard to selection of theories and methods and in the translation of these into a real-life intervention.

IM step 3: theoretical methods and practical strategies

Methods

In the third IM phase, change objectives were linked to practical strategies derived from theoretical methods for behaviour change. A method is a general theory-based technique to accomplish changes in behavioural determinants; a practical strategy is the specific application of a method, in such a way that it fits the target group and the intervention context.

Results

Because of the strong focus in our matrix on motivation, self-efficacy, coping and skills training, we

selected SRT [27], the TTM [26] and Social Cognitive Theory (SCT) [29] as the theoretical backbone of the intervention. Both SRT and TTM state that people go through several stages or phases to reach their health goals. This fundamental view not only guided the delineation of performance objectives but also the identification of potentially useful intervention methods: consciousness raising (TTM), dramatic relief (TTM) and decisional balance (TTM), modelling (SCT), guided practice (SCT), self-monitoring (SRT) and coping planning (SRT).

We selected 'biofeedback', 'Motivational Interviewing' (MI) and 'behavioural journalism' as the main intervention strategies. The aim of biofeedback is to enhance personal relevance by providing feedback on individual health conditions [30]. This is relevant when people have difficulties in linking the behaviour and health consequences and if the target group is not aware of the risk of the behaviour. Motivational Interviewing is a client-centred counselling style that supports clients exploring and resolving their ambivalence about behaviour change [31]. In MI four core principles guide the counselling: 1) expressing empathy (i.e. non-judgemental listening, acceptance and recognition of the clients needs); 2) developing discrepancy (i.e. highlight the difference between current behaviour and clients goals); 3) rolling with resistance (i.e. avoid arguing for change) and 4) enhancing self-efficacy (i.e. by reducing barriers of change and developing skills to overcome problems). In behavioural journalism [29], real-life role models serve as the sender of the health messages ensuring that messages are compatible with the norms, perceptions and language of the target population.

When translating methods into strategies, it is crucial to acknowledge that a method may be only effective within certain parameters or conditions. For instance, behavioural journalism is based on modelling, and the parameters for modelling are that the audience can identify with the model, that the model is rewarded for the desired behaviour, that the audience possesses the self-efficacy needed for the desired behaviour and that the model is a coping model rather than a mastery model [32].

This implies that the real-life model stories have to be very carefully selected to meet these parameters.

IM step 4: programme development

Methods

In IM Phase 4, the actual intervention was designed, produced and piloted. First, we collected most of all existing Danish intervention materials addressing adolescent smoking cessation. Second, a group of five experts and practitioners evaluated if the materials covered one or more of the specified change objectives and if strategies met the theoretical considerations for use. In case existing materials did not meet these requirements, new materials were produced in order to cover all necessary change objectives. Role model stories were taken from interviews of adolescents who successfully had quitted smoking. The 'role models' represented both genders, different school types, different age groups and different regions of the country.

In the production phase, dummy versions of the new materials were piloted among 10 adolescent smokers and revised according to the feedback given. In addition, we secured that the intervention format took into account the factors essential for recruitment and implementation.

Results

The final intervention included a 'cessation stand' with two counsellors offering CO measurements, proactive non-confronting short counselling based on Motivational Interviewing and a range of supportive materials, such as self-help guides, postcards, a small competition and referral to an Internet/SMS/email-cessation support system. Specifically for this intervention, we developed the self-help guide, additional postcards and the counsellor manual. The counselling followed a three-step sequence where smokers initially were CO measured and (dependent of their attitude towards quitting) they were interviewed about their smoking status and history, motivation for quitting and cessation strategies. In the last step, they were referred to additional help (a smoking cessation web page or/and a cessation guide) and were asked whether they were interested

Performance objectives for adolescent smokers	Determinants	Knowledge	Attitudes	Self-efficacy	Skills	External: Support from friends in near social environment
Decide to quit smoking		Can mention reasons for stopping smoking	Express that the benefits of cessation exceed the disadvantages of quitting Recognize that the negative consequences of smoking is personally relevant Experience social accept of smoking cessation	Express confidence regarding ability to quit smoking		Support the person who wish to stop smoking (give positive feedback) or Accept that the person wishes to stop (does not give negative feedback)
Commit to the quit attempt		Explain that that it requires energy to change behaviour.	Experience that smoking cessation is important and demands a special effort.			
Identify difficult situations/determine smoking function*		Can identify situations where smoking is used to cope with e.g. psychological problems, social (indirect) pressure or other situations cigarette cravings			Demonstrate the skills to monitor own dependency	
Make coping plans*		Explain that there is different types of coping strategies and that the strategies can be combined, and used differently dependent of the actual situation	Experience that it is important to have a plan for difficult situations Realize that smoking cessation implies certain coping skills Experience that social relations is important in order to successfully quit smoking	Are confident in own ability to make appropriate coping plans	Show the ability to make a coping plan for situations with physiological, social, psychological and others types of cravings	Agree to support the quitter
Quit smoking		Know that it is better to stop now than later	Have an intention to become smoke-free	Feel confident they can quit	Can lay down a quit date	Support the new behaviour
Perform coping plans		Can mention alternative lines of action in difficult situations	Experience accept of alternative lines of action	Feel confident they can ask social relations about support Are confident that it is possible to perform the alternative lines of action in real life circumstances	Have skills to communicate the wish for support Have skills to perform alternative lines of action in different situations with craving	Accept the new behaviour
Evaluate and adjust strategies		Know that cessation is an ongoing process that requires a continuous effort Know where to seek help in difficult situations		Are confident they are able to change plans	Can monitor the efficacy of the coping strategies Can change or replace ineffective strategies	
Maintain cessation		Know that some conditions change as part of the quitting process	Accept that some problems 'hurt'/ Realise that cessation demands a certain effort Gives attention to both positive and negative changes of the cessation process Accept possible negative side effects (e.g. weight gain)		Can register the changes of the cessation process Can determine strategies to cope with negative side effects.	Give positive feedback

Fig. 2. The matrix of performance objectives, determinants and change objectives. *The identification of difficult situation and the planning of coping responses also are important steps after the quit date. In cases where persons quit without preparation, the steps do occur after the actual quit date.

in 'challenging' their smoking. The purpose of the smoking 'challenge' was to give the smokers an opportunity for making a small cessation experience (for instance, not to smoke in the following break); challenges were defined together with the individual adolescent. The events were organized in a central place at the school (typically in the cantina) from 10.00 a.m. to 13.00 p.m. and were run 1 day a week for 4 weeks in a row.

In addition to the written intervention materials for the adolescents, we developed a manual and a training course for counsellors. The manual focused on the core principles of Motivational Interviewing, the adolescent smoking cessation process, the concept of short counselling and practical information on how to set up a smoking cessation event and how to use the materials as part of the intervention. These topics were also covered in a counselling training including role-playing, demonstrations and supervision.

IM step: Development of implementation plan

Method

The fifth phase in IM concerns planning for implementation.

Results

A central-local strategy was developed in order to define responsibilities for all involved partners. The central level were defined as the Danish Cancer Society and the local level as coordinators being responsible for smoking prevention in the counties. A scheme with performance objectives for the coordinators were made indicating which actions they had to perform in order to secure implementation. These were decided to participate in the project, contact relevant schools, enrol schools in the project, identify a contact person at each school, identify relevant student groups, recruit counsellors, organize special training for the counsellors and contact schools for planning programme execution. The DCS had the overall responsibility for programme management and was responsible for monitoring progress in the implementation plan for the coordi-

nators, for developing a web page with background information relevant for counsellors, for organizing a 3-day course in adolescent smoking cessation counselling and for providing materials with easy access and low cost. In addition, the DCS was responsible for organizing annual meetings with all coordinators.

IM step 6: preparing for process and effect evaluation

Methods

In Step 6, we wrote an evaluation plan with formative and effect evaluation measures based on the objectives identified in the programme development process.

Results

We designed a randomized controlled trial with 11 interventions and 11 control schools with a measurement of baseline, short-term and long-term effects. Based on the previous IM steps, we selected the following behavioural variables for the effect evaluation: smoking, smoking cessation, quitting attempt, change in smoking consumption and participation in cessation support (other than the intervention). In addition, we chose the following variables focussing on change objectives and determinants: motivation/decisional balance, awareness of cessation support options, perception of personal health relevance, experience of social support, self-efficacy expectations and perception of quitting methods. The process evaluation was designed to give us an opportunity for estimating reach and use of the intervention and allow us to draw a profile of the users of the intervention.

Discussion

In this paper, we have used the methodology of Intervention Mapping to develop an adolescent smoking cessation intervention with a focus on implementation and recruitment. We found that guided practice, modelling, self-monitoring, coping planning, consciousness raising, dramatic relief and

decisional balance were suitable methods for adolescent smoking cessation, and we selected behavioural journalism, guided practice and Motivational Interviewing as main strategies in our intervention. We used two strategies to secure widespread implementation: (i) involvement of local agents in programme planning and (ii) focussing on designing the intervention in a format that would appeal to a large group of adolescent smokers.

In order to take into account the implementation and recruitment barriers in both the schools and among the target group, we developed an alternative to the 'traditional' smoking cessation course that is usually recommended for smoking cessation interventions [2]. Therefore, we planned an event-based intervention with a 'cessation stand' with two counsellors offering CO measurements, proactive non-confronting short counselling based on Motivational Interviewing and a range of supportive materials, such as self-help guides, postcards, a small competition and referral to an Internet/SMS/email-cessation support system.

Since this study do not present evaluation data, we cannot make conclusion about whether the intervention will be effective in helping adolescents quit smoking. However, the high transparency of the decisions taken in the development process with insight into both the overall goals of the intervention, the performance and change objectives and the theoretical methods and strategies used in the intervention design is crucial when designing and evaluating health-promoting interventions. This knowledge makes it possible to identify specific weaknesses in the intervention, and, subsequently, to make appropriate improvements. In addition, methodological transparency is crucial in order to gain insight into why some seemingly identical interventions are effective and others not and when transmitting experiences from one intervention area to another [33, 34].

Although the planning process was guided by IM, not all IM tasks were completed like suggested by the protocol. First, time and funding restrictions made it impossible to perform a study on determinants of smoking cessation in a Danish adolescent sample. Therefore, the assumptions on determi-

nants that formed the basis of intervention development might not have been valid for the adolescents in our trial. Second, when making estimations of importance and changeability of cognitive and social determinants in Step 2, we could not find specific recommendations in the literature regarding adolescent smoking cessation. Therefore, the selection was based on general scientific insights in the smoking cessation literature and consensus among programme planners. Finally, one could argue that we selected the schools as setting for the intervention before the actual development process and therefore choose not to take into considerations alternative delivery platforms to soon in the process. The reason for this selection was our experience that the adolescents did not want to participate in smoking cessation interventions if participation was too difficult. We therefore designed the intervention to be delivered in a setting that most Danish adolescent use on a daily basis. However, we cannot exclude the possibility that other settings could have been suitable for the intervention also. In spite of these shortcomings, the IM methodology proved to be essential to develop a systematic adolescent smoking cessation intervention with strong focus on implementation and recruitment of adolescent smokers.

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Conflict of interest statement

None declared.

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